Journal of the Society of Arts.

FRIDAY, JULY 20, 1855.

ARTIZANS' VISIT TO PARIS.

The Secretary has been informed that the French railways have undertaken the transit of passengers to visit the Exhibition at half price, or, in other words, will convey persons on their lines to Paris and back at one fare. The Secretary had hoped to have been able to insert a copy of the official letter from the Managers of the Northern of France, but up to the time of going to press it had not been received by him.

The following announcements have been made for assisting parties coming from the north. Messrs. Brownlow and Co., of Hull, advertise that

"The first-class steam-ship *Gazelle* is intended to sail from Hull for Antwerp every Saturday evening, as soon after six o'clock as the tide permits, during the Paris Exhibition. Best cabin fare, *out and home*, 15s., *with leave to return within a month*, by the *Gazelle* on Wednesdays, or *Emerald Isle* on Saturdays. Trains leave Antwerp for Paris every two hours, the fares being—First class, 29s., Second do., 21s. 6d., and Third do., 16s."

The North-Eastern Railway advertises cheap trips to Paris from Leeds or Normanton to Antwerp and back, and makes the following announcement:—

"The fares from *Leeds or Normanton to Antwerp and back, including cost of passports*, will be—First class, and saloon of steamer, 30s.; Second class and saloon, 28s. Trains leave Antwerp for Paris, which they reach in ten hours, every two hours during the day, proceeding by way of Ghent, Courtray, Lisle, Douay, and Amiens to Paris. In returning, the route may be varied, by taking the railway passing through Douay, Valenciennes, Mons, Brussels, and Malines, to Antwerp. The steamers return from Antwerp on Wednesdays and Saturdays, and the tickets are available for either boat. In order that the passports may be in readiness on board the steamer on the arrival of passengers at Hull, it is necessary that application be made to Mr. Goslett, passenger superintendent, Leeds, or to Mr. Smithson, booking clerk, Normanton. The hours of sailing for the remainder of the month will be as under:—Saturday, July 21, 10.0 p.m., passengers leaving Leeds at 6.35 p.m.; Wednesday, July 25th, midnight, passengers leaving Leeds at 6.35 p.m.; Saturday, July 28th, 7.0 p.m., passengers leaving Leeds at 3.40 p.m."

DECIMAL COINAGE.*

By FREDERIC JAMES MINASI.

[The object aimed at in the following lecture is, to present a popular exposition of this important subject, comprised in a brief explanation of decimal arithmetic and its application to scales of money, weights, and measures; a short account of the decimal coinage movement; and a classified outline of the various proposals brought before the public for effecting the desired alteration, with the chief objections that have been made to them. The whole is designed to furnish information on the present state of the question, and better enable those who may be desirous of taking a part in the discussion, to obtain a general view of the subject.]

The ordinary method of counting by tens arose in the very earliest period of human society, and is believed to owe its origin to the circumstance of the possession of ten fingers (*digiti*). So universally is this method employed, and so completely has it obtained a hold in all our ordinary conceptions of number, that it is not without some degree of surprise that the student of arithmetic discovers for the first time that there really are other ways of reckoning besides that he has hitherto looked upon as the only possible one, and, in fact, that it is but one of an infinite variety of methods by which magnitude can be expressed. Accounting for the present method of notation in the ordinary way, it would be natural for one who desired numerically to record the magnitude of a mass composed of individual items, as a flock of sheep, for example, to count them by means of his fingers up to ten, beyond which he could not proceed without recourse to the expedient of a mark, perhaps upon one of the fingers, to signify that he had completed that number, by which he would disengage the ten digits for a repetition of the same process, to be registered in like manner upon a second finger; ten fingers thus distinguished would necessitate a second kind of mark, representing ten of tens, or hundreds; proceeding in this manner, he would now be free to count to thousands, when a fresh commencement by a third description of mark would enable him to proceed to ten thousand, and so on; the analogy of the ten fingers being kept up even when large numbers rendered it impossible or inconvenient longer to use those organs. This is essentially the ordinary or decimal scale of notation.

On this way of accounting for its universality, it is not difficult to believe that had man been possessed of twelve, instead of ten fingers, he would have proceeded to that number before recording it in the manner just pointed out; thence he would have advanced to twelve twelves, or 144, from that to 1,728, and so on in a twelve-fold progression, forming what is called the duodenary, or duodecimal scale. Similarly, other circumstances would have originated scales of notation based on higher or lower numbers.

World-wide as our method of counting is, it is, nevertheless, remarkable that until comparatively recent times it was employed only in the numeration of whole numbers, the unit being the lowest on the scale. One Stevin, to whom is attributed the introduction to public notice of a more complete application of the decimal scale to the representation of fractional numbers as well as integers, published a work on this subject in the Flemish language, which was translated into English in 1608, entitled "*Disme; the Art of Tenths, or Decimal Arithmetic: teaching how to perform all computations whatever, by whole numbers without fractions, by the four principles of common arithmetic, namely, addition, subtraction, multiplication, and division; invented by the excellent mathematician, Simon Stevin.*" From this it would appear that the application of the decimal scale to the arithmetic of fractional numbers has been in use less than three centuries. The invention of logarithms was doubtless a means of contributing to its extension.

In examining the composition of the scale of tens, it will be noticed that its base being composed of the product of the prime factors 2 and 5, no power of ten can be divisible without a remainder by any other figures than these or their combinations—in other words, no prime factors but 2 and 5 are to be found among the submultiples of 10 and its powers. On this account it is that the decimal scale is really inferior to the duodecimal system of notation, the prime factors of which are 2 and 3, and the submultiples—the various combinations that may be formed of their powers—as 2, 3, 4, 6, 8, 9, 12, &c., a condition highly advantageous in the representation of such common and

* A Lecture delivered before the Metropolitan Society of Schoolmasters, at Westminster, April 21, 1855.

useful divisions as thirds, sixths, twelfths, &c., which on the decimal scale can only be represented by an interminable progression.

The common method of enumerating by the dozen, or by the gross of twelve dozen, the subdivision of the shilling and pound troy into twelve pence or ounces, the foot into twelve inches, and, perhaps, the year into twelve months, are important examples of the want afterwards felt of a more useful scale of notation than that which had been established in the earlier ages of society, and seems to refute the opinion of an eminent authority in this matter, that "if an educated community had to begin again, all should be decimal, or in tens." It has even been proposed that a notational reform should be attempted, for the purpose of substituting the duodecimal for the decimal scale in arithmetic. In Swift's *Laputa* possibly such a recommendation might have been deemed worthy of being put into effect, but with the ordinary class of mortals so overwhelming and perplexing a change would be a task utterly hopeless to attempt; to our present mode of notation we are, no doubt, wedded while the world lasts.

The various operations of arithmetic being reducible to the four elementary processes of addition, subtraction, multiplication, and division, or, as some think, of *addition* and *diminution*, it becomes a question of no little importance, particularly with a great commercial and intelligent people, to enquire how far the employment of the compound scales of money, weights, and measures is necessary, and whether, by the adoption of others founded entirely on the base 10, as in simple numbers, the time employed both in the acquirement and use of commercial figures might not be greatly abridged, and at the same time, the operations of arithmetic, especially with concrete numbers, be simplified and rendered more certain.

I shall not here enter upon an inquiry into the origin and peculiarities of the various conventional scales of monies, weights, and measures, employed in this and other countries; it will be enough to say that their divisions are, for the most part, unnecessarily complex and most ununiform in character, rendering, in many cases, an arithmetical calculation an operation painfully troublesome even to the skilled computer, a state of things which has in not a few instances given rise to the formation of tables, or the employment of a simplified scale, to effect the process with greater ease and certainty. We have an example of this latter kind in the application of our measures of length and surface to the purposes of land surveying. In order to obtain the area of a field in acres, it would be necessary, if the legalised measures were used, after taking the dimensions in yards, and computing the area in square yards, to divide successively by 30¼, 40, and 4, to obtain the number of acres, roods, and poles, in the surface, a process which involves so much trouble, that it led to the invention of *Gunter's chain* of 100 *links*, which, by general consent, has become the instrument employed by the professed land-measurer in the highly important duty he is called upon to exercise, and by the aid of which he is enabled to make his calculation with simple arithmetic only; he, in fact, uses a decimal scale of length and surface. Had our money been

10 pence = 1 shilling,
10 shillings = 1 pound sterling,

Or our table of weights—

10 ounces = 1 pound,
10 pounds = 1 stone,
10 stones = 1 cwt.,

and other scales on the same principle, it is clear at once that compound and simple arithmetic, so far as such scales are concerned, would be identical.

The advancement of practical science, and the increasing demands of commerce, have combined to render this subject one of peculiar interest to the world at large. Already have many countries of Europe and America adopted such a reform in their monies, weights, and measures, by re-arranging them in a decimal progression. The following, according to Laurie,* is a list of the principal countries and places where a decimal system of coinage is employed:—

Algiers	Corfu	Japan	Portugal
Bahia	Corsica	Leghorn	Rome
Basle	France	Lima	Russia
Belgium	Geneva	Madeira	St. Domingo
Brazil	Genoa	Mauritius	Turin
Chili	Greece	Milan	United States
China	Holland	Naples	Venice

and, lately, Canada† has adopted the dollar of 100 cents.

The United States may be looked upon as taking the lead in this matter in 1786, and, subsequently, the French Republic, in 1795, introduced the decimal system among the many alterations they put into practice at that time. In the instance of America, a change was in some measure necessitated by the confusion that existed in the different States relative to the values of the various kinds of money then current among them. In the case of France, the alteration was of a most radical character, effecting an entire change of all weights and measures, their *Système Métrique* being founded on scientific principles, and the new denominations independent of those already in existence. The effect of a change so violent as this was to disturb the habits and familiar ideas of past centuries, and in its original shape the plan was not adopted by the majority of the population, so that subsequent legislation and even alteration became necessary to reconcile the habits of the people to the loss of their old and well understood measures and weights.‡

In our own country within the past forty years various attempts have been made to bring about a decimal system of monies, weights, and measures, in lieu of those now in use among us. In the year 1816, when the sovereign was issued instead of the guinea, which was the coin previously in circulation, and when the new silver money was substituted for that which was then called in, the subject of a decimal system of monies was agitated, and the matter was discussed in pamphlets and the public prints of the day, and, among the rest, the *Times* newspaper strongly urged the adoption of a system founded upon that of France. For some reason or other, however, the subject was dropped. In 1824, it was again brought before the legislature by Sir John Wrottesley, who urged a system founded on the pound, but without any success. In 1838, a Royal Commission was appointed to make inquiry into the advisability of decimalising the weights and measures of this country. In their report in 1841, it is remarked, that although not forming part of the subject of their inquiry, yet, as being so intimately connected with it, they felt bound to recommend the introduction of a decimal coinage. Another commission, having the same object as the previous one, was appointed in 1843, whose report appeared in 1853. In reference to public opinion on the subject, they observe—"We wish to state our opinion that, in reference to the decimal scale generally, the public mind is very greatly changed, and that the introduction of a decimal system will now be very easy in respect to many points which a few years ago would have offered great difficulties." They further allude to the decimal coinage in terms similar to those of the previous commission. A practical step was taken in 1847 by the issue, at the instance of Sir John Bowring, of the florin, or tenth of a pound, in the desire to introduce the change on the principle of a descending progression from the sovereign. In the early part of 1853, a committee of the House of Commons was appointed to investigate the question of a decimal coinage for this country. The committee consisted of the chairman, Mr. Tufnell, but subsequently, Mr. W. Brown, Messrs. Cardwell, John

* Expositor of Foreign Languages.

† It is reported that a decimal coinage has just been adopted in Sweden.

‡ Yates, on the French system of measures, weights, and coins, p. 5. See also Pasley's remarks on the same subject.

Ball, Alderman Thompson, Dunlop, Matthew Forster, Moody, Hamilton, John Benjamin Smith, Kinnaird, Lord Stanley, Sir William Clay, the Marquis of Chandos, Sir William Jolliffe, and Viscount Goderich.

The witnesses examined before this committee were:—Thomson Hankey, jun., Esq., late Governor of the Bank of England, James Laurie, Esq., wine merchant, Sir Charles W. Pasley, K.C.B., Lieut.-General in the Royal Engineers, Professor Airy, the Astronomer Royal, Sir John Herschell, the Master of the Mint, Mr. Augustus de Morgan, Professor of Mathematics at University College, London, Thomas E. Headlam, Esq., M.P., Mr. F. Strugnell, grocer and teadealer, R. C. L. Bevan, Esq., banker, Mr. S. Lindsey, grocer and teadealer, Mr. Chas. Meeking, draper, G. Arbuthnot, Esq., Auditor of the Civil List, the Duke of Leinster, Mr. W. Miller, cashier in the Bank of England, Mr. Henry Taylor, clerk to Messrs. Whitbread and Co., brewers, Mr. W. Brown, M.P., Rowland Hill, Esq., secretary to the Postmaster-General, Mr. Francis Bennoch, commission warehouseman, John B. Beard, Esq., architect and engineer, Thomas Bazley, Esq., President of the Chamber of Commerce at Manchester, Kenneth Dowie, member of the Liverpool Chamber of Commerce, Mr. Henry Kirkham, clerk and manager in a tea and grocery establishment at Liverpool, Charles H. Gregory, civil engineer, Mr. Jacob A. Franklin, professional auditor and public accountant, and Sir John Bowring, Her Majesty's chief Consul at Canton; in all 25.

It should not be unnoticed, that with some it is a question to what degree the composition of this committee was conducive to an unbiassed opinion on the important subject intrusted to its investigation, and how far the selection of the witnesses who were examined before it may be regarded as placing the question fairly before the public.*

Their report was published in August, 1853, in which, from the evidence before them, they arrive at the conclusion that our present monetary system, with its corresponding plan of accountancy, "is shewn to entail a vast amount of unnecessary labour and great liability to error, to render accounts needlessly complicated, to confuse questions of foreign exchanges, and to be otherwise inconvenient." They further state that a decimal system of coinage "would lead to greater accuracy, would simplify accounts, would greatly diminish the labour of calculation, and, by facilitating the comparison between the coinage of this country and other countries that have adopted the decimal system, would tend to the convenience of all those who are engaged in exchange operations, of travellers and others. An important benefit would be derived in several departments of the public service, and in every branch of industry, from the economy of skilled labour that would result from the proposed change, at the same time that the education of the people generally would be much facilitated by the introduction into our schools of a system so directly calculated to render easy the acquirement of arithmetic." On these points the witnesses examined seem to have been unanimous, nor has much opposition at any time been brought forward to these views.

It is not to be denied that there are opinions deserving the highest respect which refer to the sub-division of our money of account, as at present constituted, as one admirably adapted for the important requirements of retail trade, and superior in this respect to almost any that can be based upon the decimal scale only; and the division of the pound sterling into 240 pence, or 960 farthings, is looked upon as an evident arrangement to this end. The following tables exhibit a comparison between the sovereign divided respectively into 960 and 1000 parts:—

PROPORTIONAL PARTS OF A POUND AS AT PRESENT.

10s. 0d.	=	$\frac{1}{2}$*	6d.	=	$\frac{1}{40}$*
6 8	=	$\frac{1}{3}$	5	=	$\frac{1}{48}$
5 0	=	$\frac{1}{4}$*	4	=	$\frac{1}{60}$
4 0	=	$\frac{1}{5}$*	$3\frac{3}{4}$	=	$\frac{1}{64}$
3 4	=	$\frac{1}{6}$	3	=	$\frac{1}{80}$
2 6	=	$\frac{1}{8}$*	$2\frac{1}{2}$	=	$\frac{1}{96}$
2 0	=	$\frac{1}{10}$*	2	=	$\frac{1}{120}$
1 8	=	$\frac{1}{12}$	$1\frac{1}{2}$	=	$\frac{1}{160}$
1 4	=	$\frac{1}{15}$	$1\frac{1}{4}$	=	$\frac{1}{192}$
1 3	=	$\frac{1}{16}$	1	=	$\frac{1}{240}$
1 0	=	$\frac{1}{20}$*	$0\frac{3}{4}$	=	$\frac{1}{320}$
10	=	$\frac{1}{24}$	$0\frac{1}{2}$	=	$\frac{1}{480}$
8	=	$\frac{1}{30}$	$0\frac{1}{4}$	=	$\frac{1}{960}$
$7\frac{1}{2}$	=	$\frac{1}{32}$	In all 27 divisions.		

PROPORTIONAL PARTS OF A POUND IF DIVIDED INTO MILS.

Mils.	s. d.			Mils.	d.		
500 (=	10 0)	=	$\frac{1}{2}$*	20 (=	$4\frac{4}{5}$)	=	$\frac{1}{50}$
250 ,,	5 0	,,	$\frac{1}{4}$*	10 ,,	$2\frac{2}{5}$	,,	$\frac{1}{100}$
200 ,,	4 0	,,	$\frac{1}{5}$*	8 ,,	$1\frac{23}{25}$	,,	$\frac{1}{125}$
125 ,,	2 6	,,	$\frac{1}{8}$*	5 ,,	$1\frac{1}{5}$	,,	$\frac{1}{200}$
100 ,,	2 0	,,	$\frac{1}{10}$*	4 ,,	$\frac{24}{25}$	,,	$\frac{1}{250}$
50 ,,	1 0	,,	$\frac{1}{20}$*	2 ,,	$\frac{12}{25}$	,,	$\frac{1}{500}$
40 ,,	0 $9\frac{3}{5}$	,,	$\frac{1}{25}$	1 ,,	$\frac{6}{25}$	,,	$\frac{1}{1000}$
25 ,,	0 6	,,	$\frac{1}{40}$*	In all 15 divisions.			

Those marked (*) are common to both divisions.

Nevertheless, for ease and simplicity in ordinary instances of computation, it is scarcely to be doubted that the employment of a decimal system of accountancy stands pre-eminent. Not only would there result a great saving of time, and, by consequence, of expense, in all cases where extensive calculations are carried on by its employment, but the various processes of arithmetic would be rendered more certain because more simple.* But to you, gentlemen, perhaps the most interesting result contemplated is that which has relation to the change that would take place in the school-room. We are pretty well agreed, I think, that what is called commercial arithmetic occupies a large portion of the time of both teacher and scholar; that the comparatively simple four first rules of arithmetic are only introductory to the more complex scales of money, weights, and measures. Then, indeed, comes the tug of war. What with mastering the tables and puzzling himself with every variety of multiple and submultiple, some of them actually fractional, and involving operation with operation, no wonder that much valuable time is consumed before the pupil thoroughly masters the application of arithmetic to practical purposes. The advocates of a decimal system therefore, not without reason, point to the advantages that would accrue in an educational point of view, to the establishment of so simplified a mode of computation. Professor De Morgan, who has paid much attention to this subject, says, "I think that taking all the schools in the country, commercial as well as classical, and considering in how many of them reading, writing, and arithmetic, form the great mass of what is taught, I am not putting it too high when I say that arithmetic forms the fifth part, in time, of all the primary education given in the country, that is, 20

Since writing the above, a leading journal of the day remarks as follows:—"The way in which the question has been brought forward seems to be this. A committee of the House of Commons was obtained to investigate the subject of a decimal coinage, which, by a curious coincidence, happened to consist not only of persons favourable to a decimal system of accounts and coins—for in that there would be nothing marvellous—but of persons who had made up their minds to one particular method of carrying out that system—that, namely, which is ordinarily known as the pound-and-mil scheme. By another coincidence, no less singular, this committee examined 26 witnesses, all of whom were in favour of this same scheme, and the testimony would have been as unanimous as the report. had not Mr. Headlam, the member for Newcastle, volunteered to give evidence of a plan of his own, and so jarred the accord."—*Times* leader, June 15, 1855.

* It has been computed that the saving in the public service would amount to a considerable sum.

per cent. of all the primary education. I think that is under the mark. I am sure I am putting the evils of the present system rather low when I say that they cause one-fourth of that time to be uselessly employed, that is to say, one-twentieth part of the time spent in primary education in this country I consider to be thrown away by the present system of coinage, weights, and measures."* Mr. W. Brown, M.P., says, that a knowledge of arithmetic could, under a decimal system, be acquired in one-fourth the time employed at present.† In the *Eclectic Review* for November, 1854, a writer on this subject states that Practice and Proportion will virtually cease, and that Vulgar Fractions will also be done away with in commercial arithmetic, which will no longer require the pupil to employ the compound rules.‡

Whilst admitting, however, the great advantages of the decimal over the ordinary compound scales, some amount of caution should be used with statements coloured, perhaps, by the enthusiasm of those who thus seek to recommend the system to the public. Some writers on this subject are no doubt to be regarded simply as theorists—men who, however highly gifted they may be in scientific attainments, do, nevertheless, lack that practical acquaintance with educational routine that should more fairly and properly be sought from the intelligent teacher himself. Recurring to the references just made, for instance, it may be asked how far it would be possible or advisable to banish all knowledge of the arithmetic of the compound measures, especially when, leaving out the question of any advantage that might be considered to attend their employment as a praxis, they will be required while the change is taking place (considered by some to be not less than 20 years, and by others even longer), and whilst such numbers are employed in other countries, especially in exchange operations, or when the student of history would compute the measures and weights of bygone times; indeed it may even be questioned whether some of our present scales could ever admit of a decimal form, as the seven days to the week, or 365 days to the year; and as to Practice, Proportion, and Vulgar Fractions, why should they be of less moment, when they obviously furnish methods more simple, in some cases, than the employment of decimals only. A reference to Guilmin's *Arithmétique*, one of the authorised works for public instruction in France, will prove useful on this point. With a complete decimal system of money, weights, and measures, the pupil is there nevertheless introduced to "*Regles de Trois;*" "*Fractions ordinaires;*" "*Conversion des anciennes mesures en nouvelles, et réciproquement, et conversion des mesures étrangeres en mesures Françaises;*" processes which require, more or less, some acquaintance with compound arithmetic. Gentlemen, I recommend this part of the subject to your serious and careful consideration, confident that its true value will be fairly estimated in your hands.

(*To be continued.*)

BRITISH IRON MANUFACTURE.

REMARKS ON THE REPORT OF THE SELECT COMMITTEE OF THE HOUSE OF COMMONS ON THE PETITION OF CONINGSBY CORT, ELDEST SON OF THE LATE MR. HENRY CORT.

BY RICHARD CORT.

The following is the Report, which is divided into paragraphs for the sake of reference:—

1. Your Committee in the first instance beg leave to state, that they have ascertained, by means of returns laid before them, particularly from the Custom House and Navy Board, that for several years past, British iron has regularly continued more and more to supersede the use of foreign iron for home consumption, except in the manufacture of steel; and that it has most rapidly increased as an article of export. Thirty years ago the iron imported averaged about 50,000 tons; in the year 1810 it amounted only to 20,500 tons. At the former period the export was no more than a few hundred tons; but in 1810 it had increased to 24,500 tons.

2. It appears to your Committee, that these alterations in such an important branch of trade and manufacture, have been effected by the industry and talents of numerous individuals, who, previous to the date of Mr. Cort's patent, and subsequent to it, have exerted themselves with much skill and perseverance and with a great expenditure of capital, for the purpose of conducting experiments on a large and practical scale; among these Mr. Cort appears to have possessed a considerable share of merit.

3. Your Committee have not been able to satisfy themselves that either of the two inventions claimed by him, one for subjecting cast iron to an operation termed puddling, during its conversion into malleable iron; and the other for passing it through fluted or grooved rollers, were so novel in their principles, or in their application, as fairly to entitle the petitioners to a parliamentary reward.

4. Moreover it appears to your Committee, that, in fact, no good malleable iron can at this time with certainty be made by the method claimed as the invention of Mr. Cort, unless the cast iron has previously been converted into what is called finery or finer's metal, by a process since found out.

5. Statements have been made, which your Committee deem worthy of most serious attention, inducing a belief that the bad qualities occasionally found in some British iron, must be imputed to the circumstance of workmen or manufacturers omitting this additional process, by which they save a considerable expense, and produce bar iron equal in appearance to that of the best quality, but wholly unfit for most useful purposes.

6. Yet, nevertheless, being convinced that Mr. Cort is fairly entitled to some share of the improvements so extensively beneficial to the country, your Committee entirely approve of the annuity of £200 a year granted to him, and of that of £125 a year since extended to his widow; and they would further observe, that the petitioners, viewing the merits of their late father through the medium of partial affection so natural to their situation, seem quite exempt from any charge of presumption in thus soliciting the bounty and liberality of parliament. Your Committee cannot therefore refrain from expressing a hope, that the House will deem it right, so far to comply with the prayer of the petitioners, as to bestow on them such a moderate sum as may cover the expenses necessarily incurred during the investigation.

March 20, 1812.

The following are the names of the gentlemen composing the Committee:—Mr. Davies Giddy, Chairman; Lord Arthur Somerset, Sir Thomas Thompson, Sir Richard Bickerton, Sir Charles Mordaunt, Mr. Benjamin Hall, Mr. Lyttleton, Mr. Lyggon, Mr. Davis, Admiral Markham, Admiral Moorsom, Mr. Wharton, Mr. Croker, Mr. Robert Ward, Mr. Hughes, Mr. Dugdale, Mr. Grenfell.

N.B. In the above list will be found several high official and naval authorities, secretaries of the Treasury and Admiralty, and merchants, but only one member connected *practically* with the *Iron Trade*, Mr. Benjamin Hall, of the Firm of Crawshay, Hall, and Bailey, the principal witness in support of the petition. Mr. Manners Sutton states, that he was commanded by His Royal Highness the Prince Regent to acquaint the House, that having been informed of the contents of the Petition, he recommends it to the consideration of Parliament.

Since this Report was drawn up 43 years have elapsed, and the present statistics of the Iron Trade by the last

* Evidence before Select Committee on Decimal Coinage, 709.

† Proceedings of Decimal Association, p. 17.

‡ Page 608.

returns to parliament for three years ending 5th January, 1855, shew on the average of three years, the results as compared with the following periods:—

	Pig Iron, with Pit Coal.	Bar Iron.	Puddled, Rolled, &Wrought Iron.	Import.	Export Bars.	Export, all sorts, Cast & Rolled.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1782	...	...	...	50,000	427	..
1787	85,000	30,000	...	70,000	...	...
1811	350,000	150,000	250,000	20,500	24,500	...
1855	3,000,000	1,600,000	2,500,000	40,965	612,830	1,145,788

It will be seen by the above, that the import of bar iron, in 1855, was 20,465 tons more than in 1811. This was owing to the increased demand for the Swedish iron for the finest steel, the total quantity of the latter alone during the last ten years being not less than 260,000 tons besides supplies from Russia—yet, as compared with the import in 1787, the decreased import is equal to 29,035 tons.

Hence, from the statistics of the case, it will at once be observable that to whomsoever in a particular degree can be attributed the merit of these changes in the manufacture of British iron, which have increased the make of pig iron with the cheaper pit coal, instead of the dearer charcoal, from 85,000 tons to 3,000,000 tons; the manufacture of 30,000 tons of bad hammered iron to 2,500,000 tons of good rolled bar and wrought iron, including 1,600,000 tons of bar iron; decreased the import of bar iron from 70,000 tons to 29,035 tons, and increased the export of British iron from 427 tons to more than *eleven hundred thousand tons*, justly deserves to be placed in the highest catagory of those who are entitled to be accounted benefactors to their country and the human race.

No. 2.

In this paragraph the Committee alludes to the "alterations" in the manufacture of British iron which had occurred up to 1810 (1811), and to their having been effected by the industry and talents of "numerous individuals" previous to my late father's patents. But, whatever may have been the number of these persons, or whatever their merits, they were circumscribed, according to the showing of the Committee, to a few hundred tons in 1782. At the same time, some of the "numerous individuals" referred to by the Committee may have introduced improvements entitling them to commendation; but what they were, whether real or imaginary, whether depending on puddling or rolling for profitable existence or not, we are unable to state, not being aware of their distinctive nature or character; besides, the whole of the "numerous individuals," except my father, were nameless, while the merit of the latter was patent and notorious to all who had made or handled British iron in the three kingdoms for the last seventy years; his inventions being as under:—

In 1783, for rendering pig or cast iron malleable in an air furnace, heated by the flame of pit coal, without the aid of charcoal, blast, bellows, or cylinder, termed puddling; and the other in 1784, for grooved or fluted rollers, for the manufacture of bar, bolt, and rod iron, never before used, and since universally adopted.

From these two improvements, as from their fountain head, have flown these facilities, despatch, economy, and improved quality in the manufacture of British iron, has expanded this source of national wealth and industry, and extended the commerce of the country in this article alone to all the markets in the world.

No. 3.

The averment made by the Committee in this paragraph, that "they have not been able to satisfy themselves that either of the two inventions claimed by Mr. Cort were so novel in their principle or in their application as fairly to entitle the petitioners to a parliamentary reward," requires under this head that we should enter more fully into details; for if the Committee were unable to satisfy themselves, after all the principal ironmasters in the kingdom had so fully satisfied themselves, by using and profiting by both inventions, for more than 20 years previously, and after knowing that they had publicly declared themselves, only the year before, indebted to Mr. Cort for the principle and the application of both inventions, the Committee ought to have found no difficulty in satisfying their own minds on the same subject.

The Carron Company, in Scotland, had used pit coal successfully for making pig iron, but never for puddling in an air furnace previous to 1783 and 1784, and were so convinced of the novelty and importance of the principle and application of my father's discoveries, that in their letter, dated February 18, 1786, to John Wanchope, Esq., writer to the signet at Edinburgh, from Mr. C. Gascoigne, they voluntarily offered to supply my father with pig iron to any extent, to rent him a forge, and to place the entire direction of the works in his own hands, with or without his own workmen; besides which, it is well known that all previous attempts for puddling in an air furnace heated with pit coal had not succeeded, the last having been abandoned by the Colebrook Dale Company in 1782, as utterly hopeless, called "Buzzing."

Mr. Joseph Reynolds, the chief conductor of the Colebrook Dale Company, who subsequently was among the first to erect new works for puddling and rolling on my father's principle in 1788 and 1789, states, in his letter to Mr. Price, of Birmingham, dated 13th February, 1812, that "great credit was due to Mr. Cort for the use of rollers instead of hammers, the advantage of forming the iron with rollers being so very great, and may be fairly considered as the principal cause of the *great increase of the British iron trade*, by reducing the expense of the manufacture, and facilitating the production of prodigious quantities of bar iron with few workmen." Again, in a letter to my late brother, William Cort, dated 20th February, 1812, both read to the Committee, he observes, "I am convinced that your father's undisputed invention of rollers was of much more assistance to the iron trade than puddling from raw pig, even after some improvements were made."

The late Mr. Samuel Homfray, of the Penydarran Iron Company, one of the witnesses examined, admits in his evidence that "Finers' metal," being his own process, was afterwards puddled exactly as Mr. Cort did with the pig, and that he had seen iron rolled into *plates*, but never into bars, previous to 1783 and 1784. This witness attempts, nevertheless, to throw doubts on the novelty of my father's inventions, and to disparage his merits, but his whole evidence is contradictory in itself, and directly at variance with his own practice and previous admissions, as will be seen by the following communications. First, as to his own practice.

Mr. James Cockshutt, who had been twenty years in the iron trade previous to my father's patent, and was in partnership with the late Mr. Richard Crawshay, when the latter and himself visited my father's works, in 1787, and witnessed for the first time in their lives the operations of puddling and rolling, states in his letter to my late brother Coningsby Cort, dated 10th April, 1812, that, "Mr. Samuel Homfray always had a vigilant eye to their proceeding at Cyfartha, and not only borrowed of him the patterns of my father's puddling furnaces, which he had used for the erection of the works at Cyfartha, but also my father's workmen, to instruct him how to use both the puddling and rolling processes; besides which, he borrowed the very patterns which had been used for constructing the mill at Cyfartha, adding, if Mr. Crawshay had not been convinced of your father's just claims, he never would have signed an agreement *to pay ten shillings per ton for all the iron rolled under his patent*, and still less expended a large capital for the erection of works to use both the puddling and rolling processes." In a letter from the same witness, Mr. Samuel Homfray to the late Mr. Richard Crawshay,

dated the 10th November, 1787, read to the Committee, and admitted to be in his own hand-writing, he states that he considered Mr. Cort's plan to be "the best and cheapest."

Sir Jeremiah Homfray, likewise brother of the same witness, in a letter to my father, dated March 11, 1789, also read to the Committee, states, that "the Penydarran Iron Company was then using his plans for puddling and rolling, and that he was confident they could make one ton of good bar iron with 30 cwt. of pig iron, and that the forge in use by Mr. Crawshay, on his plan, was a noble work, and turning out three tons of blooms weekly. In confirmation, also, of the successful operation of the works carried on by the Penydarran Iron Company, under the direction of the witness, Mr. Samuel Homfray, and his brother, they not only profited by 20,000 tons of puddled and rolled iron sent to market under my father's patents, between 1788 and 1798, *gratuitously*, as will be more fully explained in another place, but also profited for thirteen years subsequently, previous to 1812, to a very large amount, by puddling and rolling. For or nearly the same period, twenty-four years, the Penydarran Company sent down the Glamorganshire Canal not less than 265,496 tons of puddled and rolled iron, and if *one-third* be added for *waste* in conversion, the iron consumed by puddling and rolling would be 353,994 tons [see Scrivenor's work, p. 124], so that it may be asked whether the whole quantity of pig iron made during the last sixty-five years by the Penydarran Iron Company did not closely approximate to *one million tons*, and the profit to *one million sterling*, including puddled and rolled iron, or how much more or less?

Among other preposterous statements made by Mr. Samuel Homfray, especially after borrowing my father's plans to build his own work for puddling and rolling, he assured the Committee that a Mr. Butler, of Newport, a tin plate manufacturer, was the inventor of grooved rollers, and the first to use them in 1782, yet the witness preferred exposing himself to legal proceedings by Mr. Butler in 1789, by adopting my father's plans instead of the plans of the original inventor, Mr. Butler, who had, according to his own evidence, a prior right to the invention, although no attempt was made by Mr. Butler himself, to stop the patent being granted to my father.

Besides, it may be asked, if all the benefit which had resulted from grooved rollers for 23 years previously to 1812, were due to Mr. Butler, and not to my father, why did all the principal iron companies in South Wales, including his own company, as well as others elsewhere, in 1811, *mistake* Mr. Cort for Mr. Butler by acknowledging themselves indebted to the former and not to the latter.?

As regards, however, Mr. Butler and his invention of grooved rollers in 1782, it will be seen from the following plain statement of facts by Thomas Llewellyn, in his letter to my late brother, the petitioner, dated 30th November, 1812, Llewellyn being at that time chief roller man at Cyfartha, where he had acted on my father's recommendation in the same capacity for 20 years, will show best why Mr. Homfray preferred using my father's plans and workmen to those of Mr. Butler's, for he states that, "he went to Mr. Cort's works at Fontley, in March 1784, to see the puddling and rolling of bar iron. In February, 1785, Mr. Cort sent for him to work as roller man at Fontley, and that he worked there till October 1785, when Mr. Cort gave him leave to fetch his wife and children, then living near Newport, and that as he was within less than half a mile from Mr. Butler's tin mills, having a brother in law and sister at work there, he called to see them. Mr. Butler, finding that he had been working for Mr. Cort, asked him if he thought that *bolts* could be rolled out of the shearings of tin plates with Mr. Cort's patent rollers, and having assured him he thought it might be done, he was requested to give Mr. Butler's foreman the requisite instructions for using Mr. Cort's rollers for this purpose (in 1785, not 1782), meaning to apprise Mr. Cort that he might call on Mr. Butler to pay for the patent right."

Under this head I have also to notice the evidence of Mr. William Crawshay, of the Cyfartha Iron Works. This witness stated that "if his family had pursued the plans of Mr. Cort, his family would have been ruined."

This is a strong remark, and if it could be proved to be correct, it would sweep away the very pedestal upon which my father's claim to public merit rests. But let me analyse the remark, and bring it to the touchstone of facts and proofs. This witness is still living, now a man of princely fortune, and was, in 1812, both a young and inexperienced ironmaster. To refute the statement above quoted, a letter was produced and read to the Committee, from the late Mr. Richard Crawshay, to Mr. James Weale, Secretary to Lord Sheffield, dated the 1st Dec., 1808; after describing his own works in exact conformity to the specification of my father's patents, he states he took the plans from a Mr. Cort, who had a little mill at Fontley, near Gosport, and that he was then making *ten thousand pounds annually*.

To shew that the late Mr. Richard Crawshay did *not* act upon the principle that he would be ruined if he pursued the plans of my father, he not only was the first to erect colossal works in exact conformity to his plans, but my father personally superintended the constructior of them, and instead of not pursuing them when built he had carried them on most extensively for nearly 2 years previous to the date of his letter, and when he die he left a princely fortune to his family, but never paid on farthing to my father for 40,000 or 50,000 tons of rolle iron before my father's patents expired.

Some idea may be formed as to the kind of plans that would have brought the family of Mr. Crawshay to ruin had they been followed, as they have been for 65 years, by the following facts:—

In twenty-four years, from 1817 to 1840, Messrs. Crawshay and Co. sent down the Glamorganshire Canal not less than 613,144 tons of puddled and rolled iron (see Scrivenor's work, p. 124 and 257); and, if *one-third* be added for waste in conversion, the whole quantity of iron consumed in these operations was not less than 817,430 tons, while for the preceding and subsequent years, from 1789 to 1754 inclusive, 65 years, the total make of puddled and rolled iron must have been enormous. In only one year, 1849, the total make of pig iron, by Crawshay and Co., at Cyfartha, Ynisfach, and Herwisen, is reported to have been 72,000 tons, or nearly as much as the whole make of Great Britain, exclusive of Scotland, in 1787 (when probably not less than 80 puddling furnaces were then actually in use); persons employed, 5,000; wages at the rate of nearly £200,000 per annum; see letter from Daniel Evans, Esq, who obtained, personally, this information at the works, in the *Morning Chronicle*, 20th March, 1850, so that it may be asked whether the whole make of pig iron, in 65 years, was not *two millions* of tons, and the profit on all sorts, including puddled and rolled iron, *two millions* sterling—or how much more or less? The Dowlais Iron Company, represented by the late Sir John Guest, Bart., M.P., are stated, in the same letter, by Mr. Evans, to be using 77 puddling furnaces, and the Plymouth Iron Works 48 puddling furnaces.

The following evidence, to which there is not the slightest allusion in the Report, although read to the Committee, will show that the statements made both by Mr. Samuel Homfray, on behalf of the Penydarran Company, and by Mr. William Crawshay, for Crawshay Hall, and Bailey, were completely at variance with the proceedings of a general meeting of the iron trade of Great Britain, held at Gloucester, on the 29th March, 1811, when it was unanimously resolved, that the iron trade was greatly indebted to the late Henry Cort for his exertions in introducing the puddling process to public attention, and for his invention of grooved rollers for the manufacture of bar iron; also, that a subscription be forth-

with commenced for the relief of his widow, Elizabeth Cort, and her family, when the principal iron companies then assembled subscribed as under:—

Crawshay, Hall, and Bailey	£21
Dowlais Iron Company	21
Penydarran Iron Company	21
T. W. and B. Botfields	21
Robert Thompson	21
William Reynolds and Co.	21
Benjamin Gibbins and Co.	21
R. J. and A. Hill	21
John Adenbrooke	21
Treve, Cook, and Powell	21
Colebrooke Dale Company	21
Harford, Crocker, and Co.	21
Tredegar Iron Company	21
Reynolds, Blakemore, and Co.	21
John Read	21

Other Iron Companies afterwards subscribed, making the whole nearly £1,000.

ON HYDRAULIC LIMES, ARTIFICIAL STONES, AND DIFFERENT NOVEL APPLICATIONS OF SOLUBLE ALKALINE SILICATES.

By M. Fr. Kuhlman.

(From *Cosmos*.)

Entrusted, about the close of the year 1840, with some trials relative to some abundant efflorescence, which was formed on a perfectly new building, and which was considered to be due to the formation of nitre, I was soon convinced that the efflorescent salts were formed to a great extent of carbonate of soda, and that the lime which had been used (hydraulic lime, from the neighbourhood of Tournay), was the cause of the efflorescence which had been observed. A closer examination soon taught me that all limes, and particularly hydraulic limes and natural cements, contained appreciable quantities of potash and soda.

Theory of Hydraulic Limes.

In a work which I had the honour of presenting to the Academy, at a meeting held on the 5th of May, 1841, I endeavoured to explain the part which potash and soda might play in stones and cements, and I admitted that these alkalies served to bring the silica to the lime, and thus to form silicates, which, by means of the application of water, solidified a portion of the mass, producing the formation of a hydrate, analagous to that which takes place with plaster. I have pointed out since then to the Academy numerous facts as the basis of this theory, and that, among others, of the immediate change from fat lime to hydraulic lime, by simply treating with a solution of silicate of potash. If, after the burning of the limestone, potash is in contact with silica, the silicate which is formed must necessarily react, and this can only take place as soon as the burnt lime is brought into contact with water.

I have greatly added to my experiments on this head, and I have established the fact that, with fat lime and silicate of potash, both of them pulverised and mixed in the proportion of 10 or 12 of silicate to 100 of lime, a lime can be obtained which shall have all the characteristics of hydraulic lime. If these substances are not well pulverised the reaction will be very incomplete, and an effect will subsequently be produced, bringing on disintegration. If from my former trials there results the possibility of converting a fat lime into an hydraulic mortar, by sprinkling it with a solution of an alkaline silicate, in my more recent trials I have found a means of producing at once with a vitreous silicate and lime, hydraulic cements of any required degree of strength. This will enable us to form, at a reasonable expense, buildings to stand the action of water, in places where fat limes alone are now found. Powdered silicate of potash in some sort becomes an agent for producing this hydraulic property, of which future experience will determine the value.

Artificial Stones.

Looking at the great affinity of lime for silica dissolved in potash, I was naturally led to examine the action of alkaline silicates on calcareous stones. Here I was still more fortunate, for the alkaline silicates became at once the means of a variety of applications of the highest utility. Let us look at what is said on this point in the *Comptes Rendus* of the Society's meetings.

"By mixing some powdered chalk in a solution of silicate of potash, a cement is obtained, which hardens slowly in the air, assuming a degree of stiffness, which, under certain circumstances, renders it applicable for the restoration of public monuments and the manufacture of moulded articles.

"Chalk, whether in an artificial paste or in its natural state, plunged into a solution of silicate of potash, takes up, even when cold, a quantity of silica, which may be increased considerably by exposing the chalk alternately to the action of the siliceous solution and the air. The chalk assumes a smooth appearance, a compact grain, and a colour more or less yellow, according as it is more or less impregnated with iron.

"Stone thus prepared is susceptible of a high polish. The hardness, which is at first but superficial, penetrates by degrees into the centre, even where there is considerable thickness. It appears capable of becoming of incontestible utility in the formation of works of sculpture, and ornaments of the most delicate workmanship; for when the silicifying process—"*silicatisation*"—has been effected on well-dried chalk, without which good results are not possible, the surface remains unalterable.

"Some attempts made to render this stone applicable for lithography give promise of great success.

"This method of converting soft limestone into siliceous limestone is likely to become a great acquisition in the art of building. Ornaments, unaffected by damp, and of great hardness, may thus be obtained at little cost; and, in many cases, a plaster made with a solution of silicate of potash will preserve from subsequent decay ancient monuments formed of soft limestone. This same plaster may become of general application in those countries where, as in Champagne, chalk forms almost the only building material."

I have shown experimentally that that one part of the silica from the silicate becomes separated by the action of the carbonic acid of the air, but that those parts of the silicate which have come into contact with a sufficient quantity of carbonate of lime pass into the the state of silicate of lime. My work, presented to the Academy in 1841, pointed out numerous industrial purposes to which the impregnating of porous bodies of mineral substances might be applied, whether the objects operated upon were organic or inorganic. Considering these applications of the art as of the first importance in building, I have attempted to extend them, and I have just laid before the Academy a new series of observations.

Harmonising the Shades of the Silicified Stone.

I have given the name of "*silicatisation*" to this remarkable conversion of soft and porous limestone into siliceous and compact limestone. As the operation of this process to articles of sculpture and building materials gives rise to a colouring very frequently so marked as to render the joinings more apparent and the veins more distinct, I have been compelled to seek a remedy for this objection.

There are two essential and general points to be met. Chalk walls are too white, while some kinds of ferruginous limestones are too sombre in their shades. To obviate this inconvenience, I perform the *silicatisation* of limestones which are too white with a double silicate of potash and magnesia. This is a vitreous substance, which forms a brown solution, and which when used in the process causes a little oxide of manganese to be deposited in the artificial siliceous paste. Oxide of cobalt, too, will

combine, though in very small quantities, with silicate of potash. Silica precipitated by a current of carbonic acid is of a brilliant azure blue. This silicate may be used in the treatment of white marbles.

When the shades of the stone are too decided, and that is the most common defect, I obtain good results by mixing in the silicate solution a small quantity of artificial sulphate of barytes, which in penetrating the porous stone, whilst it forms a layer of silica, remains fixed, entering, as we shall see below, into a state of chemical combination. As regards the joints, they may be made with common cements, the shades of which may be rendered lighter by means of some white substances, but they may be still more entirely concealed with broken pieces of the stone itself mixed with silicate of potash, the whole being well pulverised previous to its use, and applied in a state of liquid paste.

COLOURING THE STONE.

In the course of my researches for giving to these silicified stones shades which would cause those portions of our buildings which had been submitted to this process to harmonise with those which had not, I was led to submit the stones to an actual dyeing process by impregnating them in the first instance with certain metallic salts, which by precipitation would produce the required colour.

Thus, impregnating the stone with salts of lead or copper, and afterwards bringing it into contact with sulphuretted hydrogen gas, or a solution of hydrosulphuret of ammonia, I obtain at will grey, black, or brown shades; with salt of copper and ferrocyanide of potassium I get shades of copper colour, &c.

In the present case I have made an observation which in a chemical point of view is not devoid of interest.

I have stated that the porous limestones, when submitted at a boiling heat to solutions of metallic sulphates whose bases are insoluble in water, give rise during the whole reaction, to a disengagement of carbonic acid, and to the fixing in sufficient depths metallic oxides in intimate combination with sulphate of lime. When the metallic sulphates have a coloured base, very beautiful tints of different and perfect shades are obtained. Thus, with sulphate of iron we get the production of a tint in red rust, more or less deep according as we operate with solutions of green vitriol more or less concentrated; with sulphate of copper the stone takes a magnificent green tint; with sulphate of manganese brown shades are obtained; with a mixture of sulphate of iron and sulphate of copper we get a chocolate colour. I have also experimented with sulphates of nickel, chromium, cobalt, &c., and with mixtures of these sulphates.

The affinities which determine the reactions in question are sufficiently powerful to cause the metallic oxides to be completely absorbed by the stone, so much so, that certain oxides, such as that of copper, for instance, entirely disappear from the solutions after boiling with an excess of chalk.

It is remarkable, that when in operating with mixtures of salts of copper and salts of iron or of manganese, the oxides of iron and manganese are the first to be thrown down.

When we operate with sulphates having a colourless base, such as sulphate of zinc, magnesia, or alumina, we equally obtain the precipitation from the oxide, and their penetration to a certain depth in the stone, with a disengagement of carbonic acid.

The bi-sulphate of lime gives analagous results.

In general, when we intend to use coloured stones in buildings, &c., or to form mosaics, it will be found useful to increase their hardness by the silicifying process.

We may proceed in the same way with articles in shell, white coral, &c., in which the colour may be produced by the same process, acting at different pressures.

I will conclude this head with an important observation, which is, that the double sulphates which are formed in penetrating the stone, make a body with it, and increase its hardness to such an extent, that when certain sulphates are employed, such as that of zinc, the silicifying process becomes unnecessary.

The editor of "Cosmos" adds, the process which has just been described, is likely to tend to the production of a great and new industry, splendid specimens of which are to be found in the Exposition Universelle, placed in the central gallery of the "Annexe," on the banks of the river, opposite the produce from the mines of Anzin. We shall examine these specimens with care, and give a detailed account of them when we treat of the section of the chemical arts. The display made by the celebrated chemist of Lille is one which deserves great attention.

Home Correspondence.

MEN OF SCIENCE AND PATENTEES.

SIR,—In your last, Mr. W. Bridges Adams adverts to three most important desiderata, namely, the establishment of a proper system of remunerating and encouraging the labours of men of science, properly so termed, the improvement of the system of adjudicating in matters of patent rights, and a statute of limitations (so to speak) in regard to evidence as to the validity of patent rights. Now although I fully coincide in the necessity of every one of these, yet I differ both with Mr. Adams and Sir J. Paxton, as regards the propriety of appropriating any part of the Patent Office revenue for the purpose of remunerating the man of science, as such, for if there be any considerable surplus beyond what is necessary, or *might be made available* for the efficient working of the patent law, then I think equity requires that patent fees be reduced, in accordance with such surplus, and then, of course, there would be no fund out of which the payment could be made. As regards the benefits conferred by men of science upon inventors, although they are great, yet I do not think the body of patentees ought to pay the scientific explorers instead of the public, for they are in reality joint participators in a *public work*—social and industrial progress—therefore *the public* should pay both parties; moreover, I think Mr. Adams will readily admit, that it would be rather hard to call upon those patentees to pay the men of science, whose only advantage has been to pay for great seals, stamps, &c., and expend time and ingenuity in that which has never realised a penny. It appears to me, that as regards working for the public without remuneration, the men of science and men of practice are pretty much in the same position,—there is in reality no better chance of obtaining proper remuneration for the one than for the other.

With regard to improving patent law adjudications, I would reiterate what I have so often stated when advocating patent law reform, previous to the passing of the Patent Law Amendment Act, viz., that this must go hand-in-hand with cheapening and facilitating the obtainment of patent rights if any real good is to be done, for on the one hand the public have a right to the means of protection against the undue assumption of patent rights, and on the other, real inventors ought to have the means of securing their property assured to them in a ready and inexpensive manner. In this matter I would suggest that whereas the plaintiff now procures a scientific witness (as it is termed) to combat on his behalf against the defendant's scientific witness, neither of them giving the court and jury a view of the whole case, but only a view of the case *in favour* of the party for whom he may be called, that instead of this, a list of scientific and practical men should be kept at the Patent Office, who should be referred to *by the court*, and this without extra expense to the litigants, the expense of these official witnesses be made to fall on the Patent Office revenue, thus the court and jury would obtain unbiassed opinions for their guid-

ance, and the parties relieved of the greatest part of the expense.

As regards limiting the evidence of want of novelty, either by reason of public use or public record, as against the validity of a patent, I quite agree with Mr. Adams, though I would make the term as short as 30 years. Such an enactment would be in accordance with the saving clause of the statute of monopolies, which is the keystone of our patent law, for it says that new inventions for any manner of new manufactures "within this realm *which others at the time of making letters patent and grants shall not use*," shall be valid, thus making the great test the use or non-use *at the time* of granting the patent, not the use or non-use 1000 years previous.

I am, sir,
Your obedient servant,
F. W. CAMPIN.

Strand, July 17, 1855.

UTILISATION OF SLAG.

SIR,—Mr. Mushet, in his letter last week, referred to my manufacture of artificial slag, in combination with other manufactures, by using the waste heat (so easily and generally applied) from a reverberatory furnace, for generating steam, &c.

As the ironmasters cannot be prevailed upon to use their slag, and it is not to be expected they will allow others to use their premises (even where the premises would admit), I am driven to the use of artificial slag, to shew that we are not entirely dependent on them for an economical and abundant supply, which is practically proved (to some extent) by Messrs. Chance, of Birmingham, with the Rowley ragstone, melted in a reverberatory furnace, as patented by Mr. Adcock, *subsequent* to my first patent for "clay and other plastic materials;" but as that material is confined to certain districts, similar to the ironstone, it is not likely to be generally used. By analysis it will be found that the common brick earths contain the elements of slag, namely, lime, silica, and alumina, and some of them have been taken direct from the pit to the furnace, and run into slag in less than two hours, without requiring any mixture, thereby proving that for general use, either on a *small or large* scale, there is no slag material equal to the common brick earths, which not only establishes the novelty of my first patent, but shows the applicability of the same to every locality, for the purpose of manufacturing numerous articles of unlimited demand; and as slag connot be manufactured by any process without a loss of about 80 per cent. of heat, which may be applied (on a small scale) to generating steam for grinding corn, tempering, moulding, drying, and burning of common bricks, pipes, tiles, pottery, cement, &c., &c., or used in combination with any other manufacture requiring steam, by making one fire answer the purpose of several, and in many cases making a double use of the tall chimneys, kilns, furnaces, and other buildings now actually in operation in almost every country town in England. Having shown the capability of using the waste heat, I admit it is incumbent on me to show some process in addition to those now before the public, as published by Dr. Smith (*ante*, page 338), by which slag can be manufactured alone, at a profit; I, therefore, beg to submit the following calculations for public opinion and discussion:—

SLAG AS COMPARED WITH SLATE.

Duchess slates, 24 inches by 12 inches, at £12 10*s.* per thousand (the price of slate will vary in every locality).

180 slates at 3d. per slate, 5½lbs. each—8cwt. 49lb., worth £2 5s. = 360 square feet of slag, ½-inch thick, 6¼lbs. per foot, 1 ton worth £2 5s.

360 slates at 3d. per slate, 5½lbs. each—16cwt. 98lbs., worth £4 10s. = 720 square feet of slag, ½-inch thick, 3lbs. per foot, 1 ton worth £4 10s.

720 slates at 3d. per slate, 5½lbs. each—1 ton 13cwt. 84lbs., worth £9 = 1,440 square feet of slag, ⅛-inch thick, 1½lbs. per foot, 1 ton worth £9.

One reverberatory furnace will melt 5 tons of raw material in 24 hours, the cost of which cannot exceed the following estimate (on a small scale) suitable to every locality (on a large scale the expenses in labour would be much less).

	£	s.	d.
4 tons of coal, at £1 5s. per ton	5	0	0
8 furnace-men and moulders	2	0	0
4 packers in ovens	1	0	0
8 boys	0	16	0
2 overlookers	1	0	0
Wear and tear, interest, rent, &c.	0	15	0
6 tons of raw material (dug on the spot)...	0	12	0
Cost of 24 hours in succession	11	3	0
			3
Cost of 3 days and 3 nights ...	33	9	0

PRODUCE.	£	s.	d.
5 tons of manufactured ½-inch slabs	11	5	0
5 tons ditto ¼-inch slabs.....	22	10	0
5 tons ditto ⅛-inch slabs.....	45	0	0
	£78	15	0

Profit	45	6	0
	£78	15	0

Slag is particularly adapted for roofing similar to the Crystal Palace, and may be manufactured and used similar to rough glass, with putty and paint, and if so used, the above calculations may be nearly doubled, as they are supposed to be worked as slate. Thin slabs may also be used instead of plastering, as Dutch tile are frequently used, and will admit of papering or painting immediately, and will be found a certain remedy for damp and vermin.

If worked on a large scale, a small blast furnace may be used for melting, the material to be dried by the waste heat, but as it will then be mixed with the fuel in the furnace, it will require refining, and may also at the same time be coloured, as fully described in Dr. Smith's paper, (*ante*, page 335.)

I am, sir,
Your obedient servant,
W. F. ELLIOTT.

Blisworth, July 17, 1855.

MECHANICS' INSTITUTIONS AND WORKING MEN.

SIR,—The following remarks were suggested by a letter communicated to your *Journal* by S. L. Rymer, on Mechanics' Institutions and Working Men.

Mr. Rymer thinks his letter may catch the eye of some one of experience, who will *try* to answer the question, "Why have Mechanics' Institutions not been sufficiently taken advantage of by working men?" With the experience of being a member of a working men's reading-room in Carlisle, and in the absence of anything better that may come to hand, I beg to submit the following for his perusal.

Institutions in general, Mechanics' Institutions in particular, ought to be formed and conducted so as to admit of the members feeling themselves at home, as it were, whilst attending for literary instruction and entertainment. Sensible working men do not feel themselves free enough in the company of those who are much above them in the scale of wealth and education, to enable them to take advantage of Mechanics' Institutions. To insure the attendance of working men to a literary institution, they must feel an interest in the society's welfare, have a say

in the management of it, and the subscription must be within their ability. They must hold a position equal to, and enjoy the same privileges as, the other members of the society.

To some extent this has been the case with the Mechanics' Institution of Carlisle, and probably in other parts of the country. Any member paying 8s. a year, might go upon the committee *if elected*. Notwithstanding the existence of this, universal suffrage, vote by ballot, &c., the management has for the most part fallen into the hands of the higher classes. This is natural enough. We all have a prejudice in favour of those respectable in appearance. The remedy which Mr. Rymer suggests has long been tried without success. It is in vain to tell a poor man he ought not to feel backward in the presence of those much above him in the scale of wealth and education. It is in vain to suggest to the man of wealth and education, that he should endeavour to feel himself comfortable in the company of rags, dirt, and ignorance. Let Mr. Rymer ask himself if he would like, dressed in his superfine, to elbow his way through among dusty coats; or, if he wanted a quiet read, to have his polite ears offended with the jargon of the workshop, or to pay more for his membership than he thinks he is able.

Literary Institutions for working men must be formed for those for whom they are intended. To make them successful they must be managed and supported by working men. Of this there is sufficient evidence in Carlisle. The Institution which I attend is avowedly a working man's reading-room; any other may become members, subject, however, to the rule which excludes other than working men from the committee. This may seem very odd, but it has worked well since 1848. It does not prevent the higher from mixing with the lower classes. The rich can read, suggest, vote, and enjoy *all the privileges, except being a member of committee*. It is, perhaps, a question, whether any are so likely to know the wants of working men as a committee of their own order.

The payment, a penny a week, is expected to be within the reach of most people (and can be paid easier than 2s. a quarter, or 8s. a year.) When a member is sick or out of work, he can attend without paying. For the last five years the number of names on the book has seldom been less than 200. On the second of July, they numbered 252. They are nearly all working men, who work at ill-paid employments. The member who, for a considerable period, with promptitude and energy, has discharged the duties of chairman, works at his employment for considerably less than 8s. a week. In the society he possesses, perhaps, more influence than any other member. The committee consists of twelve, besides the chairman, secretary, and treasurer. It is unnecessary to say that the funds are managed with scrupulous care. Guided by the economical housewife principle of making the income meet the expenditure, the committee manage in a manner that might put to the blush wealthier and abler committees. During the five or six years I have been a member, I do not remember a single quarter audit that showed the reading-room in arrears. This contrasts strangely with a similar Institution in Carlisle, managed by the clergy and gentry, whose balance-sheet, last year, showed them £25 in debt.

I need not tell the readers of this *Journal* that working men's reading-rooms are likely to do much good. That they are calculated to bring about a reform worthy of the name, is implied by their existence. In our Institution the papers are read for those who cannot read for themselves. The daily *Times* can be seen by the poorest as soon as it is seen by the richest. It is placed in a frame, similar in form to a small clothes horse, with only the top and bottom rail, so as to show both sides at once, and so that a number of members may read at the same time.

With the fact before him, that working men can enjoy the use of daily and weekly papers, periodicals, &c., and a library selected by their own choice, I think Mr. Rymer will agree with me when I say that, penny-a-week working men's reading-rooms are a valuable improvement upon Mechanics' Institutions.

I am, sir,
Your obedient servant,
JOHN SKINNER.

Lord street Working Man's Reading-room, Carlisle, July 9, 1855.

TRADE MUSEUMS.

SIR,—The subject of Trade Museums has for some time past occupied the attention of the Society of Arts, and the first section of the animal department is now open for public inspection, and judging from the letters which have appeared in the *Journal*, as well as the casual observation of visitors, the general current of opinion seems to be in favour of its further development.

Having watched the progress of the collection with much pleasure, as the untiring exertions of Professor Solly enabled him to secure the numerous specimens of which he was in search, and having done my humble something towards the good work, I feel interested in the experiment, and should regret if the improper location of the collection should impair the usefulness of which I believe it to be capable. A rumour prevails that either Marlborough House or the Crystal Palace will be the final home of the specimens, and it is because I incline to the opinion that neither place is appropriate that I trouble you with these remarks.

The three great groups of mineral, vegetable, and animal substances, form the raw materials of all manufactures, with infinite degrees of combination. Of the first, a very interesting and instructive museum exists in Jermyn-street; of the second group there is a similar one at Kew, and the nucleus of the third is now being exhibited at the Society's house.

The principal seat of the English mineral manufactures and commerce is not in London, and, therefore, as a matter of scientific and educational interest, it does not appear to be of much importance in what locality the metropolitan specimens may be deposited; but with respect to vegetable and animal substances the case is quite different.

An enormous amount of business is daily transacted in vegetable and animal substances in London, and it is surprising what a small amount of knowledge buyers and sellers possess of the nature, sources, properties, reasons of supply and deficiency of the articles in which they deal. Of this fact I could give several ludicrous and curious instances. Such being the case with importers, brokers, and merchants, gentlemen whose interest it is to be conversant with these subjects, how much inferior in this respect is the condition of many manufacturers, and still more to be lamented is the want of knowledge among the operatives and those who deal in the manufactured articles. Where can a person engaged in any of the trades grouped by Mr. Solly in the explanatory memorandum, learn even the principal features of the material which is the source of his living? Where can the importer of a new article get experiments fairly tried? Where can experimenters learn what has been previously attempted, and the results? Where can inquirers for new, useful, and ornamental materials, ascertain whether the articles they seek exist, and that in many cases the trade only requires encouraging? With all such matters, the directors or curators of the respective museums should be conversant, and the information be easily accessible to the public.

It is on behalf of the large classes above referred to that I object to Marlborough-house, as being inconveniently situated as a place of reference for the great number of them, and Sydenham not only on account of its distance, but also that I cannot consent that a Joint Stock Company should make use of what should be a national and free collection, as a bait to attract visitors.

The museum at Kew is instructive in itself, and for a imilar reason, an Animal Trade Museum attached to the Zoological Gardens would be interesting; nevertheless, for the purpose I have in view these are insufficient, and duplicate vegetable and animal trade collections should be deposited in the centre of the city of London.

And as enlightened is infinitely superior to unintelligent inspection, and having reference to the early-closing movement, I consider it desirable to establish, in connection with such museums, regular Saturday afternoon lectures, and I believe no difficulty would be found in obtaining the gratuitous use of Gresham Hall for their delivery. The nature, varieties, peculiarities, mode of treatment and manufacture, with many other points which at once suggest themselves, would form exceedingly attractive and instructive subjects for a course of lectures; the charge for admission should be small, say 6d. each person. On this plan, I believe, the museum would be self-supporting, for I give the young men of London, operatives, clerks, and shopmen, credit for desiring to obtain information respecting the articles by the manipulation of which they procure their living, and I am quite certain they would not be worse workmen, or buyers or sellers, by the instruction I point out. If well written, these lectures might form standard text books for similar collections in large towns, and ultimately in schools, and it should be the duty of the director to facilitate the obtaining and distribution of such educational desiderata.

I am, &c.,

WAIMA.

CEDAR FROM CANADA.

SIR,—In the arsenal at Woolwich is being consumed for all kinds of common purposes, as purchased at a common price, a wood of very remarkable quality. It is a cedar of the usual colour and odour, but of a grain and veining equal to the finest maple. I was informed that it comes from Canada amongst the usual supplies. I never recollect to have seen it in Canada, where very durable post and rail fences are made of common straight-grained (pencil) cedar. Perhaps it might have been shown in the Great Exhibition, but if so I did not remark it. Possibly some of your correspondents, either here or in Canada, may give us the information, and make this wood known for the purposes it is better fitted for in the elegancies of life. The Temple of Solomon in all its glory could have had no more beautiful cedar than this, supposing the temple cedar to have been red and not white, as the modern cedars of Lebanon.

It almost makes one think that trees have faculties like the higher classes of human beings to grow like by proximity. This cedar looks as though it had been dry-nursed by a maple, and had caught its manners and features while preserving its own complexion.

Yours faithfully,

W. BRIDGES ADAMS.

1, Adam-street, Adelphi, July 13, 1855.

THE PARIS EXHIBITION.

SIR,—Having recently returned from Paris, I have read, with much pleasure, the notice of the Universal Exhibition, by Mr. Audley, in the last number of the Society's *Journal*. I find, both in London and in the provinces, an almost general impression that the Exhibition is a failure, far inferior to Hyde-park, and not presenting any overwhelming attractions for so long a journey as a visit to it would entail, especially from the North of England or Scotland. Now, I venture to say, that nothing can be more erroneous than such a view. As regards the *area* of space or the *cubic content* of the buildings appropriated to the Exhibition, that of Paris, in the aggregate of the several edifices employed, exceeds Hyde-park Crystal Palace. The variety is greater—the facilities for arrangement are more complete, and the splendour of many of the establishments for the display of articles of luxury, is such as cannot be understood without inspection. How is it, then, that so different and so general an impression prevails?

This is easily answered. The separation of the Exhibition into different parts entirely prevents the visitor feeling the force of vast magnitude which was unfolded by a single glance on entering Hyde-park Glass Palace. Until very recently the interior was very far from complete, and, in fact, it is only by the rapid and most extraordinary development of the last few weeks, that the true character of the Paris Exhibition has been displayed. On entering the principal building—"the Palace" of Industry, the wide arched roof of glass which covers the central portion terminates by ends of highly ornamented and conspicuous stained glass, which appear like the extremities of the building, but beyond these are extensive galleries, which complete a length of 900 feet, or nearly one-half of the Hyde-park Palace of 1851. From this a gallery leads to a large circular building, around which a very extensive temporary building has been constructed, and from these another covered gallery leads to the "annexe," a building for machinery, the length of which is nearly three-quarters of a mile. These latter have only been opened to the public about a fortnight. Another very extensive building is appropriated to the fine arts. In every one of these departments the visitor will find collected so amazing a variety of rich and interesting objects, as to remove all doubts as to the exceedingly great value and attractiveness of the Exhibition, and I venture to say that the facilities it presents for observation and instruction, will meet the expectations of any who proceed thither with these objects in view, and that it is most worthy of the attention of all who are interested in any of the chief departments of national industry, or in studying the present condition of the fine arts.

I remain, sir, yours truly,

THOMAS SOPWITH.

Allenheads, Haydon-bridge, July 16, 1855.

MORTARS AND CANNON.

SIR,—I write merely to correct an error into which "Cosmos" has inadvertently fallen in his communication inserted at page 599 of your last *Journal*, where he says that, "It is obvious that horizontal fire must give a greater range than vertical fire with a weapon of a given power." The greatest range of any piece theoretically, will be at an elevation of 45 degrees, but practically, with the resistance of the atmosphere, at a few degrees lower.

HENRY W. REVELEY.

July 16th, 1855.

To Correspondents.

*** In reply to R. N., and to numerous other similar applications, the Secretary begs to state that Messrs. Field and Son, of Birmingham, the successful competitors for the Society's Prize Microscopes, have not yet completed their arrangements for the supply of the instruments. Early intimation will be given on this point.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 9th July, 1855.

Par. No.

361. Naval Payments—Copy of Order in Council.
317. Sandhurst Royal Military College—Report from Committee.
225. Bills—Public Libraries and Museums (as Amended by the Committee, on Re-commitment, and on second Re-commitment).
226. Bills—Lunatic Asylums (Ireland).
228. Bills—Lady Raglan and Lord Raglan's Annuities.
Colonial Land and Emigration Commission—15th Report.
Education (Schools and Parochial Unions)—Minutes of the Committee of Council, &c.

Delivered on 10th July, 1855.

336. Land Tax (East India)—Returns.
346. East India (Torture)—Copy of a Despatch.
350. County Courts—Returns.
364. Court of Chancery—Return.
352. Standing Orders—Report from the Select Committee.
232. Bills—Stage Carriage Duties, &c.
229. Bills—Turnpike Trusts Arrangements.
231. Bills—Merchant Shipping Act Amendment (Amended).

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette, July 13th*, 1855.]

Dated 7th June, 1855.

1308. R. Peters, Union-street, Borough—Ordnance shells.

Dated 14th June, 1855.

1358. E. Hollis, Birmingham—Securing ramrods to firearms.

Dated 20th June, 1855.

1407. J. Green, 27, Charlotte-street, Portland-place — Moderator lamps.

Dated 22nd June, 1855.

1431. W. Teall, Wakefield—Treating soapy waters.
1435. A. E. L. Bellford, 32, Essex-street, Strand—Screw-fastenings. (A communication.)
1437. A. E. L. Bellford, 32, Essex-street, Strand—Pulverising quartz, &c. (A communication.)
1439. Capt. H. N. Penrice, R.E., Woolwich—Propelling vessels.

Dated 23rd June, 1855.

1441. T. Walker, Birmingham—Projectiles.
1443. W. Pearce, Poole—Pipes, tiles, and hollow bricks.
1444. G. Whish, Birkenhead—Oscillating steam engines.
1445. I. J. Silbermann, 32, Essex-street, Strand—Globes, &c.

Dated 25th June, 1855

1447. J. Gedge, 4, Wellington-street south—Measuring liquids. (A communication.)
1449. J. Harris, Clogwynhyfryd, Merioneth—Crushing and pulverising machine. (A communication.)
1451. S. Smith, Hyson Green Works, near Nottingham—Safety valves and dampers.
1453. P. M. Parsons, Duke-street, Adelphi—Moulds for casting metals.

Dated 26th June, 1855.

1455. T. B. Sharp, Manchester, and A. Yorston, Belfast—Furnaces.
1457. J. Ronald, Liverpool—Hemp and flax machinery.
1459. B. Bonnet, Belleville, near Paris—Weaving.
1461. C. M. Pouillet, Paris—Railways.
1463. F. Raux and L. Poret, Paris—Artificial mineral waters.
1465. H. J. Distin, 31, Cranbourn-street—Rendering field bugle chromatic.

Dated 27th June, 1855.

1466. F. Russell, 13, Cumberland-market—Hanging windows and shutters.
1467. T. Swinburne, South-square, Gray's-inn—Motive power.
1468. D. D. Buhler, Paris—Fencings.
1469. F. Lucas, Duston, Northampton—Iron.
1470. L. J. F. Margueritte, Paris—Glass and crystal.

Dated 28th June, 1855.

1471. H. Walker, Sambourn, Warwick—Ploughs.
1472. J. Raywood, Wentworth—Stopping railway trains.
1473. C. Moreau-Darluc, Paris—Separating substances.
1475. S. Davey, Tucking Mill, Illogen, Cornwall—Safety fuzes.
1476. Lieut. C. C. Engstrom, 18, Buckingham-street, Strand—Breech-loading ordnance.
1477. G. Lilley, Islington—Water meters.
1478. R. Besley, Fann-street, Aldersgate-street—Metallic alloy. (A communication.)
1479. J. Skelley, Kilcurry, Longford—Carriage wheels.
1480. A. E. L. Bellford, 32, Essex-street—Manufacturing, lighting, and heating gases. (A communication.)

Dated 29th June, 1855.

1481. P. A. le Comte de Fontaine-Moreau, 4, South-street, Finsbury—Axle boxes. (A communication.)
1485. C. A. Busson, Paris—Teeth of toothed cylinders.
1483. E. J. Hughes, Manchester—Concentrating colouring matter of madder, munjeet, &c.
1484. J. B. de Lorenzi, Paris—Organs.
1485. General Dembinski, Paris—Generating steam without combustible matter.
1486. J. Eccles, Blackburn—Bricks, tiles, &c.
1487. J. Broadbent and S. P. Youle, Manchester—Machinery for cutting out gores of umbrellas, parasols, &c.
1488. W. Heaps, Forton, Lancaster—Machinery for cultivating land.
1489. J. Weems, Johnstone, N.B.—Drying grain.

Dated 30th June, 1855.

1490. W. Woodcock, Manchester—Making bricks, &c.
1491. T. Barling, Weymouth—Furnaces.
1492. W. Johnson, 47, Lincoln's-inn-fields—Manures. (A communication.)
1493. J. Birch, Bradford—Iron.

Dated 2nd July, 1855.

1494. W. H. Tooth, 4, South-street, Southwark—Earthenware and plastic articles.
1495. J. A. Mignon, Paris—Maps, charts, plans, &c.
1496. F. Lycett, Wood-street—Glove. (A communication.)
1497. W. Knapton, York—Consumption of smoke.

WEEKLY LIST OF PATENTS SEALED.

Sealed July 13th, 1855.

50. Samuel Smith Shipley, Stoke Newington—Improvements in machinery and apparatus for washing or cleansing.
109. Urbain Charles Choisnet and Charles Emile Giajola, Birmingham—Improvements in moderateur lamps.
118. George William Garrood, Burnham, Essex—An improved apparatus to be used in conjunction with windlasses on ships, cranes on land, and with other machinery for raising or lowering weights for the purpose of guiding and controlling the action thereof.
120. Joshua Horton, Birmingham—Improvements in packing or storing gunpowder.
125. James Higgins and Thomas Schofield Whitworth, Salford—Improvements in moulding for casting shot, shells, and other articles.
127. Edward Hall, Salford—Improvements in combining metallic wires with textile materials or fabrics for forming "wire ribbon."
149. Thomas Coendoz Hill, Stanton Lacy, Shropshire—An improvement in drain pipes and tiles.
158. Auguste Edouard Loradoux Bellford, 32, Essex-street, Strand—Improvements in paddle-wheels for propelling vessels in water. (A communication.)
162. John Gedge, 4, Wellington-street south, Strand—Improvements in laminating metals either in relief or bas-relief. (A communication.)
174. William Dray, Swan-lane—An improved machine for cutting chaff.
176. James Fenton, Low Moor, Yorkshire—Improvements in the manufacture of axles, shafts, rods, and bars.
187. Barnett Samuel, Sheffield—Improvements in the manufacture of knife handles, umbrella and stick handles, door knobs, articles of furniture, and other articles having the appearance and transparency of solid tortoiseshell.
190. Alexander William Anderson, Birmingham—Improvements in posting or exhibiting advertisements.
208. Samuel Mayer and William Bush, Bristol—Improvements in reducing flint and other substances, rendering them suitable for the manufacture of porcelain and other earthenware articles.
242. Auguste Edouard Loradoux Bellford, 32, Essex-street—Improvements in machinery for forging nuts and washers. (A communication.)
264. Auguste Edouard Loradoux Bellford, 32, Essex-street, Strand—An improved invention for constructing hulls of vessels.
265. John Henry Johnson, 47, Lincoln's-inn fields—Improvements in the manufacture and construction of steam boilers or generators, and in the application of materials to such manufacture. (A communication.)
285. Peter Armand le Comte de Fontaine-Moreau, 4, South-street, Finsbury—An improvement in the mode of applying as motive power heated air combined with the vapour of ether or of any other liquid easily vaporised.
561. John Gracie, Stanley-terrace, Lower-road, Rotherhithe—Improvements in wood-planing engines.
877. John Charles Pearce, Bowling Iron Works, near Bradford—Improvements in making the joints of pipes and other articles.
893. Henri Schoofs, St. Gilles, near Brussels—Improvements in making, fixing, or attaching artificial teeth, gums, and palates.
1083. William Robertson, Edinburgh—Improvements in the treatment of fuel, and its use for heating purposes.
1103. Alphonse René Le Mire de Normandy, 67, Judd-street, Brunswick-square—Improvements in converting fatty and oily substances into fatty and oily acids, and into soap.

Sealed July 14th, 1855.

105. James Peter Lark, Nine Elms-lane, Vauxhall—Improvements in effecting the combustion of fuel and the consumption of smoke in steam boiler and other furnaces.

Sealed July 17th, 1855.

133. Evan Leigh, Collyhurst, Lancaster—Improvements in machinery or apparatus for preparing cotton and other fibrous substances for spinning.
151. William Smith and Thomas Phillips, Snow-hill—Improvements in cocks or taps, and in balls or floats to be used therewith.
160. William Eisenmann, Berlin—A new construction for a hearth applicable to all firing constructions or fire places.
168. François Arsène Vasnier, Paris—Improvements in fire places.
177. George Brooks Pettit and Henry Fly Smith, New Oxford-street—Improvements in stoves and other apparatus for generating heat from gas, and in the employment and removal of the vapours produced by its combustion.
182. John Livesey, New Lenton, Nottingham—Improvements in lace machinery.
194. Richard Archibald Brooman, 166, Fleet-street—A power accumulator or apparatus to be employed with hydraulic presses. (A communication.)
197. William Binns, Claremont-villa, Victoria-grove, Brompton, and James Haughton, Bank Side New Mill, Oldham—Improvements in valves for stopping, retarding, and regulating the flow of steam, water, or other fluids.
522. John Norton, Dublin—Improvements in fire-arms and ammunition.
841. Philippe Amédée Devy, 10, Old Jewry-chambers—Improvements in the frames of swing looking-glasses.